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10,089,873



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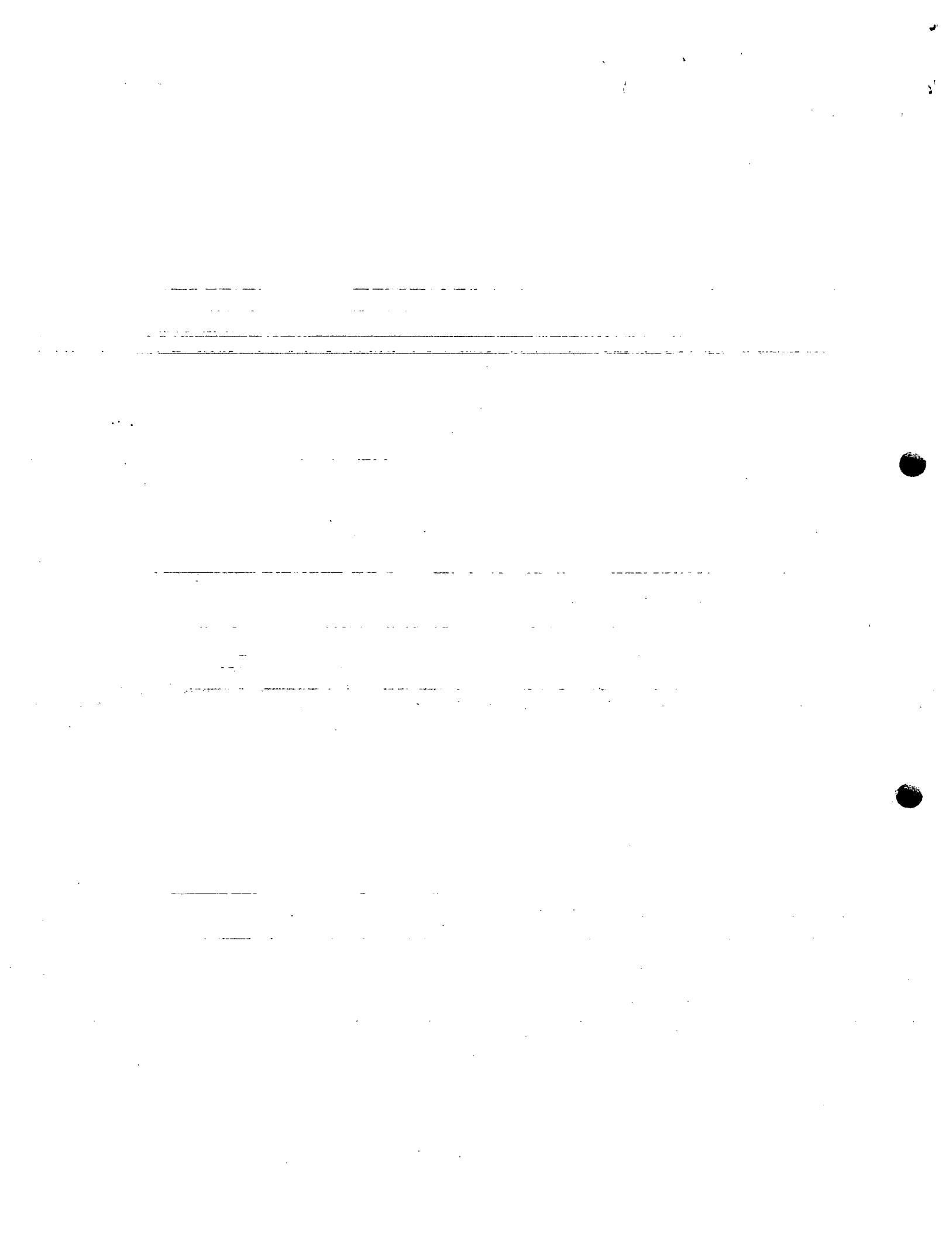
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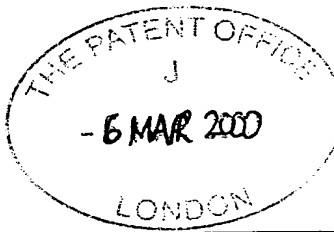


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Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form.)

06 MAR 2000



The Patent Office

**Cardiff Road
Newport
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NP9 1RH**

- | | | | |
|---|---|---|---|
| 1. Your reference | REP06376GB | 07MAR00 E518GP1-1 D02890
2017-07-07 11:47:00 0006355.3 | |
| 2. Patent application number
<i>(The Patent Office will fill in this part)</i> | 0005355.3 | | |
| 3. Full name, address and postcode of the or of each applicant <i>(underline all surnames)</i> | Freudenberg Ltd.
P.C. Box 3
Ellistones Lane
Greetland
Halifax
West Yorkshire HX4 8NJ | | |
| Patents ADP number <i>(if you know it)</i> | 77547 3700 | | |
| If the applicant is a corporate body, give the country/state of its incorporation | United Kingdom | | |
| 4. Title of the invention | NON-WOVEN ABRASIVE MATERIAL | | |
| 5. Name of your agent <i>(if you have one)</i> | Gill Jennings & Every | | |
| "Address for service" in the United Kingdom to which all correspondence should be sent <i>(including the postcode)</i> | Broadgate House
7 Eldon Street
London
EC2M 7LH | | |
| Patents ADP number <i>(if you know it)</i> | 745002 ✓ | | |
| 6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and <i>(if you know it)</i> the or each application number | Country | Priority application number
<i>(if you know it)</i> | Date of filing
<i>(day / month / year)</i> |
| | GB | 9923424 . 7 | 04 . 10 . 99 |
| 7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application | Number of earlier application | | Date of filing
<i>(day / month / year)</i> |
| 8. Is a statement of inventorship and of right to grant of a patent required in support of this request? <i>(Answer 'Yes' if:</i> | YES | | |
| a) any applicant named in part 3 is not an inventor, or | | | |
| b) there is an inventor who is not named as an applicant, or | | | |
| c) any named applicant is a corporate body. | | | |
| <i>See note (d))</i> | | | |

Patents Form 1/77

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Description 5

Claim(s) 1

Abstract

Drawing(s)

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination
(*Patents Form 10/77*)

Any other documents
(please specify)

NO

11. For the applicant
Gill Jennings & Every

I/We request the grant of a patent on the basis of this application.

Signature

Gill Jennings & Every

Date

6 March 2000

12. Name and daytime telephone number of person to contact in the United Kingdom

PERRY, Robert Edward

020 7377 1377

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NON-WOVEN ABRASIVE MATERIALField of the Invention

This invention relates to non-woven abrasive materials.

Background to the Invention

5 Non-woven abrasive materials are well known in the art. Many of these articles are manufactured from polyamide fibres (such as Nylon 6 or Nylon 66), and include a binder such as phenol-formaldehyde (PF) resin.

Most known non-woven abrasive products can be reshaped, in use, by a user, but are unable to maintain that shape. Non-woven abrasive products have been developed that may partially retain their defined shape. Other products tend to be too coarse (e.g. wire wool) or too soft (such as cotton wool).

US-A-4,355,067 discloses a fibrous scouring material. US-A-5,712,210 discloses a non-woven abrasive material roll.

Summary of the Invention

15 According to the present invention, an abrasive material comprises non-woven, synthetic fibres, and is deformable, and is able to maintain the deformed shape.

Materials of the present invention are useful in a number of applications, for example, where a deformable abrasive material is required. They also allow for alternative methods of delivery to a user, such as pinch extraction from a box or sleeve. In this way, the user may control the quantity of material dispensed for each application. In particular, the abrasive material can be separated into user-defined quantities.

25 Advantageously, the abrasive material has a low enough tear strength to allow it to be separated into the desired quantity, and a high enough tear strength to maintain a sheet or deformed sheet, when in use.

The novel material typically has a lighter and thinner structure than conventional non-woven abrasive materials. The material can be shaped, or "crumpled" into a desired form and has the ability to maintain the crumpled form. This feature arises from a lower degree of rigidity of the material, as compared with

conventional non-woven abrasive materials, together with a tendency of non-woven abrasive materials to engage with one another.

Description of the Invention

The novel non-woven abrasive material of the present invention may be manufactured from components typically found in conventional non-woven materials, and by processes similar to those used to manufacture conventional non-woven materials. For example, a method of manufacturing the novel non-woven abrasive material of the present invention may comprise the steps of:

- (i) carding staple fibres;
- (ii) cross-lapping to form a fleece;
- (iii) passing the fleece through a calendar roll;
- (iv) spraying the fleece with resin and a filler binder;
- (v) powder-spreading the fleece with abrasive grain; and
- (vi) heating in a forced air oven to dry and cure the resin.

It will be obvious to one skilled in the art that alternative methods of preparing non-woven abrasive materials are known. For example, air-laying may be used, instead of carding.

Non-woven abrasive materials of the present invention may be manufactured from three basic elements. In particular, fibres may be used having a fibre weight of between 20 and 70 g/m². Binders may be used with a binder weight of between 20 and 40 g/m². Abrasive grains may be used having a weight of between 15 and 60 g/m².

More particularly, the fibre may be 100% 17 dtex Polyamide 66. A resin and filler binder may comprise 25% phenol formaldehyde resin and 75% fused alumina silicate. The abrasive grain may be 100% aluminium oxide 180 grit.

It is understood that any synthetic staple fibre may be used, dependent on the desired use of the product and the binder system employed. Fibre deniers of between 5 and 200, or combinations thereof, may be used, dependent upon the process and also product performance requirements. The fibres used have staple lengths of about 60 mm. This may vary, dependent on product performance and process requirements.

Other abrasives, such as silicon carbide, may be used dependent upon the desired product performance characteristics of the product. It is understood that any

size, or combination thereof, of abrasive grains may be used, for example, between 36 and 1800 grit.

The following Example illustrates the invention.

Crimped staple fibres of Nylon 66 with a linear density of 17 decitex and a length of 60 mm are provided in heavily compacted bales. The fibres are opened using a willying machine and two disc openers, and air-transported to a card. This process has the effect of breaking down the larger clumps of fibre into smaller clusters.

The fibres are then processed through the card. This produces a unidirectional fleece of a light weight. This fleece is then passed into a cross-lapper, running at 90° to the direction of the card. A number of layers of fleece are built up from one another to produce a batt of 30 g/m². The batt is then compressed in a pair of calendar rolls.

The fibrous batt is then sprayed with an aqueous phenol formaldehyde (PF) resin and mineral filler slurry. The slurry includes a small percentage (<1% wt.) of pigment. Water is also added to the slurry to reduce its solids content and viscosity, thus allowing it to be sprayed. At the time of spraying, the slurry is about 70% solids.

The components making up the slurry are added together to give a total mix weight of about 800 kg. This mix is continually agitated to prevent the solid particles of filler from settling out of suspension.

The proportion of dried PF resin to filler is 1:3 and the dried weight is 50 g/m².

The wet and uncured fibre batt is passed under a powder spreader, which applies abrasive grain. The abrasive grain will adhere to the PF resin, when cured.

The abrasive grain used is 50 g/m² of aluminium oxide 180 grit.

The fibre batt, coated with abrasive grain, is passed through a forced air dryer to dry and cure the PF resin. The finished product is enrolled or cut into the desired form.

The following tests have been carried to quantify the superior "crumpling" properties of the product of this Example, identified below as TF4973. 3M 7447, 3M 7448, and Freudenberg 3635, are commercially available non-woven abrasive products.

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Test 1

A sample of size 204mm x 100mm was "crumpled" by hand. It was then released and left for 15 seconds to recover any of its original shape. The maximum and minimum axes were then measured and the retained form noted.

5

Table 1

	Minimum and Maximum Axes (mm)	Observed Form
3M 7447	80 x 60	Partially opens up and retains an
3M 7448	80 x 80	"open" scrunched form.
Freudenberg 4635	200 x 100	Recovers its original flat, sheet form.
TF4973	40 x 40	Opens very little and retains a tight ball like structure

Test 2

15 Samples of 30 mm width and different lengths were folded in half across the shorter dimension. A 9 g weight, surface area 380mm², diameter 22mm, was placed on the non-folded end. The weight was then removed and it was recorded whether or not the sample unfolded itself to lie flat again, or remained folded. The fold was not creased in any way. The greater the engagement force and the lower the rigidity, the greater the likelihood that the sample will remain folded after removal of the weight.
20 The smaller the sample, the less likely the sample will remain closed.

Table 2 Fraction of Samples Remaining Closed

	Sample Length		
	20 cm	10 cm	5 cm
3M 7447	4/10	0/10	0/10
3M 7448	2/10	1/10	0/10
Freudenberg 4635	0/10	0/10	0/10
TF4973	10/10	10/10	9/10

TF 4973 was compared with Freudenberg 4639, another commercially available non-woven abrasive material, in order to demonstrate its lower tear strength. The results are shown in Table 3.

5 Table 3

	Tensile strength (length) (N/50 mm)	Tensile strength (width) (N/50 mm)	Tear strength (N)	Fleece weight (g.m ⁻²)	Finished weight (g.m ⁻²)
TF4973	19	30	6	30	130
Freudenberg 4639	30	60	12	70	330

CLAIMS

1. An abrasive material comprising non-woven, synthetic fibres, which is deformable, and which is able to maintain the deformed shape.
- 5 2. An abrasive material according to claim 1, which can be separated in user-defined quantities.
3. An abrasive material according to either preceding claim, wherein the abrasive is in the form of grains which are held in the material by a resin or other binder.
- 10 4. An abrasive material according to any preceding claim, wherein the grains are grains of aluminium oxide.
5. An abrasive material according to any preceding claim, having a tear strength of less than 12 N.
- 15 6. A sheet of an abrasive material according to any preceding claim.
7. A method of abrading a surface, which comprises contacting the surface with a sheet according to claim 6.
- 18 8. A method of abrading a surface, which comprises contacting the surface with a sheet according to claim 6, wherein the sheet is obtainable from a larger sheet of the material having a sufficiently low strength to allow it to be separated into smaller sheets, of a desired size, and a sufficiently high strength to maintain the sheet of material when in use.